Linoleic acid in adipose tissue and risk of ischemic stroke

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ECMO-ASSISTED RESUSCITATION

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The minnesota resuscitation consortium refractory VF early mobilization protocol. one year report

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Background: In December of 2015, the Minnesota Resuscitation Consortium implemented a systems-based protocol of early mobilization to a tertiary academic hospital for patients presenting with out-of-hospital refractory shockable rhythms (VF/VT). We report the outcomes of 63 patients treated within the 1st year of the protocol.
Methods: Two major emergency medical services systems serving the Minneapolis-St. Paul metro area participated in the protocol. Inclusion criteria included age 18–75 years, body habitus accommodating automated LUCAS CPR, and estimated transfer time from the scene to the cardiac catheterization laboratory of ≤30 minutes. Exclusion criteria included known terminal illness, DNR/DNI status, traumatic arrest, and significant bleeding. Refractory VF/VT arrest was defined as failure to achieve sustained ROSC after treatment with 3 direct current (DC) shocks. Patients were transported to the University of Minnesota hospital where emergent advanced perfusion strategies (ECMO), followed by coronary angiography and PCI, were performed, when appropriate.
Results: Over the first 12 months of the protocol, 63 patients were transported directly to the cardiac catheterization laboratory. Of these, 50 patients met the perfusion inclusion criteria upon arrival (lactic acid <18, ETCO2 >10mmHg, SaO2>88%) and resuscitation efforts were continued ECMO was placed in 80%. 76% of patients had significant coronary artery disease and 67% received PCI. 82% of patients survived to hospital admission and 52% (26/50) survived to hospital discharge with 48% (24/50) achieving good neurologic function (CPC 1 and 2). Two patients developed significant lower extremity ischemia due to ECMO but had no chronic complications.
Conclusions: A systems based approach for the management of OHCA refractory VF/VT protocol with early mobilization to an ECMO /PCI capable hospital is feasible in a large US metropolitan area and leads to a high functionally favorable survival rate with few complications. A randomized trial is warranted.

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Duration for attaining favourable neurological outcome in refractory out-of-hospital cardiac arrest patients who were resuscitated with veno-arterial extracorporeal membrane oxygenation

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Introduction: Cardiopulmonary resuscitation (CPR) with veno-arterial extracorporeal membrane oxygenation (VA-ECMO) is useful for refractory out-of-hospital cardiac arrest (OHCA) patients. However, the limit of cardiac arrest duration when expecting a favourable neurological outcome is unknown.
Purpose: To assess the limit of cardiac arrest duration (interval from arrest to ECMO) when expecting a favourable neurological outcome in refractory OHCA patients who were resuscitated with VA-ECMO.
Methods: Between October 2009 and October 2016, we retrospectively analysed the data of witnessed refractory OHCA patients with shockable initial cardiac rhythm who were admitted to our hospital and resuscitated with VA-ECMO. We compared these data between favourable and unfavourable neurological outcomes on the day of their discharge. The patients with non-cardiac cause of arrest were excluded. Unfavourable neurological outcome was predicted using area under receiver-operating characteristics (ROC) curves.
Results: In this study period, 73 refractory patients with OHCA were resuscitated with VA-ECMO, and 4 patients' cause of arrest was non-cardiac. Among the included 69 patients, 62 (90%) were male, median age was 62 years (interquartile range, 50–72 years), 33 (48%) received bystander CPR, 38 (55%) had acute myocardial infarction (AMI), and 11 (16%) had a favourable neurological outcome. Interval from arrest to ECMO was shorter (median 46 [interquartile range 42–48] vs 53 [46–63], p=0.010) in the favourable neurological outcome group than in the unfavourable out come group (Table 1). Areas under ROC curves revealed that the accuracy of cardiac arrest duration in predicting an unfavourable neurological outcome was 0.75 (95% confidence interval 0.63–0.87). The cut-off value of 53 min corresponded to a sensitivity of 0.50 and a specificity of 1.0 (Fig. 1).
Conclusion: Resuscitation with VA-ECMO for witnessed refractory OHCA patients with shockable initial cardiac rhythm should be performed within 53 min.

Table 1. Comparison between 2 groups

	Favourable neurological outcome, n=11	Unfavourable neurological outcome, n=58	P-value
Age, years	59 (44–74)	63 (50–72)	0.56
Male	9 (82)	53 (91)	0.31
Bystander CPR	6 (55)	27 (47)	0.75
AMI	4 (36)	34 (59)	0.20
Interval from arrest to ECMO, min	46 (42–48)	53 (46–63)	0.010

Data are presented as the number (%) of patients or median (interquartile range).

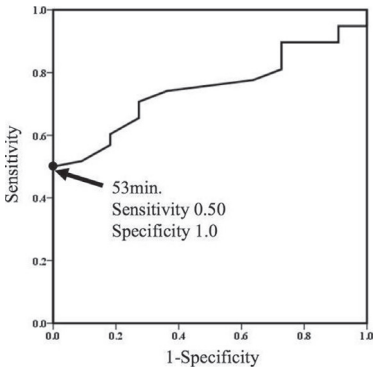

Figure 1. ROC curve of arrest duration.

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Higher survival rates in exercise-related out-of-hospital cardiac arrests, compared to non-exercise-related cardiac arrests - a study from the Swedish Register of Cardiopulmonary Resuscitation

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Background: Despite the positive effects of regular physical activity, the risk of a sudden cardiac arrest (SCA) is transiently increased during and immediately after exercise. The total incidence of exercise-related out-of-hospital cardiac arrests (OHCA) is however scarcely studied, and neither are prognosis and characteristics of these events. One of the limiting factors for previous studies has been the lack of comprehensive registries, to be able to detect the true incidence in the whole population cohorts.
Purpose: To assess the incidence of exercise-related OHCAs in the general population of all ages and to compare characteristics and prognosis of these cardiac arrests with non-exercise-related OHCAs.
Methods: All cases of OHCA outside of home reported to the Swedish Register of Cardiopulmonary Resuscitation from 2011 to 2015 in three counties of Sweden were included (population 2.1 million). This registry captures almost 100% of all OHCAs in Sweden. Information on OCHAs regarding survival, treatment and diagnosis was obtained from the registry. Additional data variables were extracted from EMS medical records and hospital medical records by a computer software.
Results: A total number of 1825 cases of OHCA outside of home where resuscitation was attempted occurred in the three counties during the study period. Of these 1825, 137 (7.5%) were exercise related, resulting in an incidence of 1.2 per 100.000 person-years. The 30-day survival rate was significantly higher among exercise-related OHCAs compared to non-exercise-related OHCAs (54.3% vs 19.4%, p<0.0001). Patients suffering an exercise-related OHCA were on average 10 years younger than those who had a non-exercise related OHCA, 56.4 years compared to 67.2 years. Exercise-related OHCAs were more often witnessed (89.4% vs 78.6%, p=0.002), had higher rates of bystander CPR (80.3% vs 61.0%, p<0.0001) and patients in this group were more frequently connected to an AED before arrival of EMS (20.4% vs 4.6%, p<0.0001) compared to cases of non-exercise-related OCHAs. The sports activities most commonly associated with exercise-related OHCA were cycling (20%), gym workout/group training (11%) and golf (9%).
Discussion: The incidence of exercise-related OHCA in the general population is 1.2 per 100.000 person-years. Cardiac arrests that occur in relation to exercise have a significantly better prognosis and outcome than non-exercise-related cardiac arrests. This may be explained by favorable circumstances such as higher degree of bystander CPR but may also reflect that these persons experience an SCA at a lower degree of coronary artery disease, due to their younger age and to exercise as a trigger.

BEST POSTERS 1
BEST POSTERS IN CEREBROVASCULAR DISEASE

P433 | BENCH
Linoleic acid in adipose tissue and risk of ischemic stroke

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Background/Introduction: Linoleic acid, the predominant n-6 polyunsaturated fatty acid, is known to reduce plasma low-density lipoprotein cholesterol and has been recommended for prevention of coronary heart disease. Whether linoleic

acid (LA) is associated with risk of ischemic stroke has not been investigated thoroughly and the results of the few previous studies have been inconsistent.
Purpose: The aim of this study was to investigate the association between the content of LA in adipose tissue, which is a long-term marker of endogenous exposure to LA, and the risk of ischemic stroke.
Methods: The Danish cohort study Diet, Cancer and Health consists of 57,053 participants aged 50–64 years at baseline. At enrolment, all participants had an adipose tissue biopsy taken. Information on ischemic stroke development during follow-up was obtained from The Danish National Patient Register, and cases were all validated. Cases and a random sample of 3,203 subjects, drawn from the whole cohort had their fatty acid composition determined by gas chromatography (wt%). Hazard ratios (HR) with 95% confidence intervals (CI) across quartiles of LA were calculated using a weighted Cox regression analysis.
Results: During a median of 13.5 years of follow-up 1,879 participants developed ischemic stroke. Adipose tissue biopsies were available on 1,755 ischemic stroke cases. After adjusting for appropriate risk factors, adipose tissue content of LA was negatively associated with ischemic stroke. HR for ischemic stroke relative to the lowest quartile of adipose LA contents was lower across quartiles, second quartile (HR 0.92, 95% CI 0.77; 1.09), third (HR 0.85, 95% CI 0.71; 1.02) and fourth (HR 0.78, 95% CI 0.65; 0.93).
Conclusion: The risk of ischemic stroke was negatively associated with the content of LA in adipose tissue suggesting a protective effect of LA against ischemic stroke.
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Assessment of vascular damage in hodgkin lymphoma survivors: effect of radiotherapy

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Background: New chemotherapeutic drugs and radiation therapy have significantly improved cancer patient's survival, although the cardiovascular (CV) side effects of cancer treatment are increasingly important. In previous studies, an increased risk of cerebrovascular complications such as stroke and transient ischemic attack was described in patients undergoing neck radiotherapy.
Aim of our study was to evaluate vascular carotid structural (IMT, plaque) and functional (carotid stiffness) damage, and changes in arterial stiffness (Carotido-femoral pulse wave velocity; cf-PWV) in Hodgkin Lymphoma survivors previously treated with radiotherapy.
Patients and methods: We enrolled 206 Hodgkin lymphoma survivors (mean age 54±14 years, 51% males, mean follow-up of 9±6 years). CV risk factors were investigated and atherosclerotic carotid damage was assessed by standard carotid ultrasound evaluation for intima-media thickness (IMT) measurement (MeanMax-IMT, CBMax, Tmax; n=167); in 141 patienys radiofrequency-based carotid stiffness analysis (distensibility; distensibility coefficient, DC; compliance coefficient; CC) was also performed. Cf-PWV measurement were obtained in 154 patients.
Results: A significant correlation between radiotherapy dose and: MeanMax-IMT (r=0.20; $p<0.05$), Tmax (r=0.20; $p<0.05$), distensibility (r=0.24; $p<0.05$), DC (r=0.24; $p<0.05$), CC (r=0.24; $p<0.05$) was observed. Patients were divided into 4 groups according to radiotherapy dose (Dose: 20–30; 31–36; 37–42; >42 Gy). An increase in Tmax (1.27±0.61, 1.35±0.59, 1.46±0.69, 1.76±1.12 mm, p for trend<0.05) and in the prevalence of carotid plaque (29%, 31%, 47% and 55%, p for trend<0.05) was observed as related to dose-category. One-hundred-seventeen patients received neck irradiation (67 bilateral; 50 unilateral). In unilaterally irradiated patients, MeanMaxIMT was greater in the irradiated side as compared to unirradiated carotid artery and the difference reached statistical significance in the group of patients who received a high radiotherapy dose (0.97±0.35 vs 0.92±0.34 $p<0.05$). Cf-PWV was significantly greater only in patients that received high dose (>42 Gy), as compared to all the other dose groups (9.7±2.3 vs 8.3±2.2, 8.0±1.5 and 8.3±1.4, $p<0.05$).
Conclusions: In this large number of Hodgkin Lymphoma survivors, carotid IMT, plaque prevalence and aortic and carotid stiffness were significantly related with radiotherapy doses. Carotid IMT, carotid and aortic stiffness were significantly higher in the irradiated carotid arteries, but only at doses >42 Gy, suggesting that there may be a dose threshold for radiotherapy-induced carotid wall damage.

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Carotid intraplaque hemorrhage and/or plaque rupture may occur at any time irrespective of symptoms

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Introduction: This study analyzes the relation between carotid plaque pathology and the presence of symptoms in a sample of CEA specimens.
Methods: Data from 261 endarterectomies performed over 5 years included full clinical data, primary risk factors, and pre-surgery color doppler ultrasound and CT recordings. Patients were classified as symptomatic or asymptomatic according with: transient ipsilateral hemispheric ischemic attack, amaurosis fugax, or nondisabling stroke within the previous 6 months. Tissue specimens were conventionally processed for histopathology, 3μm sections were stained with H-E, Mallory's trichome, Alcian blue and Movat'spentachrome. Plaques were classified as "complicated" [any of: plaque rupture plus thrombosis, plaque rupture plus intraplaque hemorrhage (IPH) plus thrombosis, plaque rupture plus IPH, calcified ulcerated plaque, IPH without plaque rupture] or "non-complicated" (none of the above).
Results: The analysis identified 126 symptomatic patients and 135 asymptomatic patients. The prevalence of complicated plaques was not different between groups: 74.6% (94/126) and 74.8% (101/135) respectively (F1,260 = 0.360, $p<0.549$, N.S.). Risk factors were highly prevalent and were not associated with the presence of symptoms: hypertension (F1,260 = 0.527, $p<0.469$, N.S.), smoking (F1,260 = 2.442, $p<0.119$, N.S.), hyperlipidemia (F1,260 = 1.62, $p<0.205$, N.S.) and diabetes (F1,260 = 0.684, $p<0.409$, N.S.) (Table 1). Complications were not dependent on symptoms (F1,260 = 0.360, $p<0.549$, N.S.).

	Symptomatic (n=126)		Asymptomatic (n=135)	
	Complicated (n=94)	Non complicated (n=32)	Complicated (n=101)	Non complicated (n=34)
Age (years)	69±8	68±8	67±10	69±10
Male (%)	81 (n=76)	59 (n=19)	77 (n+78)	68 (n=23)
Hypertension (%)	73 (n=69)	75 (n=24)	74 (n=75)	82 (n=28)
Smoking (%)	64 (n=60)	59 (n=19)	59 (n=60)	62 (n=21)
Diabetes (%)	26 (n=24)	19 (n=6)	23 (n=23)	29 (n=10)
Hyperlipidemia (%)	55 (n=52)	69 (n=22)	64 (n=65)	53 (n=18)
3RF (%)	33 (n=31)	19 (n=6)	29 (n=29)	24 (n=8)

3RF: concurrence of at least 3 risk factors.

Conclusion: As expected, symptomatic patients showed high prevalence of primary risk factors and complicated plaques. Interestingly, asymptomatic patients were not comparatively different in this regard. Present findings suggest that asymptomatic patients with severe stenosis may be at high clinical risk too for complicated plaques may occur at any time, irrespective of symptoms.
Acknowledgement/Funding: PIP CONICET 2014-2017

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Durability of stroke prevention using a dual-layer stent system in carotid revascularization in symptomatic and increased-stroke-risk asymptomatic patients: 12-month evidence from the PARADIGM study

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Background: Routine diffusion-weighted cerebral imaging and clinical data have indicated that CGuard™ MicroNET-Covered embolic prevention stent system effectively minimizes cerebral embolization in carotid artery stenting (CAS) periprocedurally and up to 30 days but long-term safety and efficacy has not been determined.
Purpose: To provide 12-month clinical (including neurologic) and duplex ultrasound (DUS) evaluation of CGuard routine use to perform CAS in all-comer (no exclusion criteria) patients with symptomatic or increased-stroke-risk asymptomatic carotid stenosis (CS) recommended for revascularization by the NeuroVascular Team (neurologist + angiologist + vascular surgeon + cardiologist) committee in a cohort of 100 consecutive CAS patients.
Methods: We performed a non-industry-funded, prospective academic study in all-referrals-tracked symptomatic and asymptomatic CS. In asymptomatic CS, intervention was mandated only in case of increased-stroke-risk features. Independent neurologist evaluation was before CAS, at 48h, 30 days, and 12 months. DUS was performed at baseline, 30 days and 12 months. There was external source data verification, external angiographic corelab, and external statistical analysis.
Results: Over 11 months, 108 referrals were NeuroVascular Team-recommended for revascularization. Carotid endarterectomy (CEA) was performed in 7 subjects while 101 patients (51–86 years, 54.5% symptomatic, evolving stroke in 9) underwent 106 neuroprotected CAS (100% CGuard use, no other stent types used during the study period). Angiographic diameter stenosis was reduced from 83±9% to only 6.7±5% ($p<0.001$, "CEA-like" effect of CAS). Peri-procedural death/major stroke/MI was 0%. One event, (extension if prior cerebral infarct on imaging, in a patient with prolonged hypotension) with no change in NIH-SS or Rankin scale and no clinical sequel, was Clinical Events Committee-adjudicated as minor stroke (0.9%). By 30 days there were no new events (0%). The clinical, neurological and DUS follow-up at 12 months was 100%. Between 30 days and 12 months, there were no stroke deaths or strokes (0%) and no MIs (0%); there was 1 heart failure death and 3 non-cardiac deaths (urosepsis, cancer, pulmonary embolism). One asymptomatic in-stent restenosis occurred at 12 months; this